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## Alife Work

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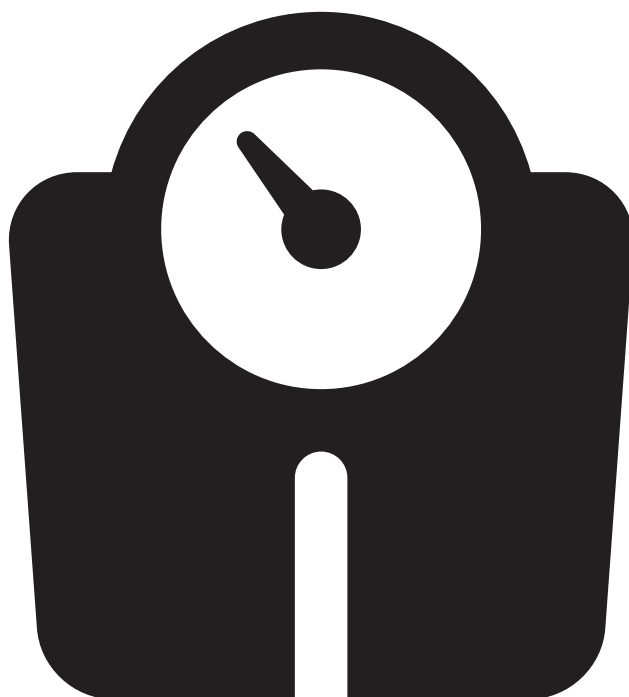
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## CHAPTER 1:

### GENERAL INTRODUCTION



## BACKGROUND

About a decade ago, overweight, and obesity in particular, was recognized by the World Health Organisation (WHO) as a major public health problem for both developed and developing countries.<sup>1</sup> Globally a dramatic increase in the number of people that are overweight had occurred. Likewise, the prevalence of overweight and obesity in the Netherlands markedly increased over the previous three decades. According to self-reported data, overweight (obesity) prevalence in adult males increased from 37% (4%) in 1981 to 52% (10%) in 2008, and in adult females from 30% (6%) in 1981 to 41% (12%) in 2008.<sup>2,3</sup>

## OVERWEIGHT, OBESITY AND HEALTH CONSEQUENCES

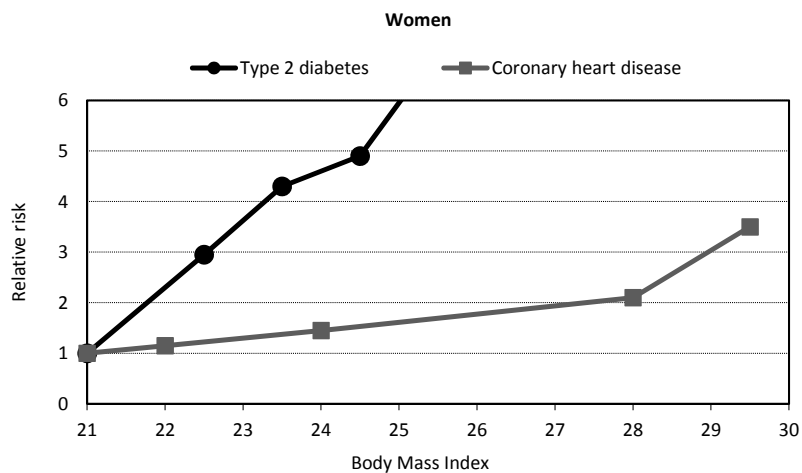
Having an excess of body weight is a proxy for an unhealthy body composition, with too much body fat.<sup>4</sup> Overweight is usually determined by the ratio of body weight (kg) to squared body height (m); the Body Mass Index (BMI). The WHO defines overweight as a BMI equal to or more than 25 kg/m<sup>2</sup>, and obesity as a BMI equal to or more than 30 kg/m<sup>2</sup>.<sup>5</sup> BMI between 25 and 30 kg/m<sup>2</sup> is sometimes referred to as pre-obesity. These cut-offs are based on mortality statistics. Nevertheless, risks of chronic conditions like coronary heart disease and especially diabetes type 2 increase progressively in both men and women from a BMI of 20-21 kg/m<sup>2</sup>, as can be seen in Figures 1.1 and 1.2 [Adapted from Willett, Dietz, Colditz [1999]<sup>4</sup>]. Other disorders that are associated with overweight include hypercholesterolemia, cardiovascular diseases, various types of cancer, osteoarthritis and fatty liver disease.<sup>6</sup>

The increase in overweight and obesity, gives rise to a subsequent increase in associated diseases. For instance, the prevalence of (diagnosed) diabetes mellitus in the Netherlands is estimated to rise from 4% in 2005 to 8% in 2025, due to aging and to a further increase in the prevalence of overweight.<sup>7</sup>

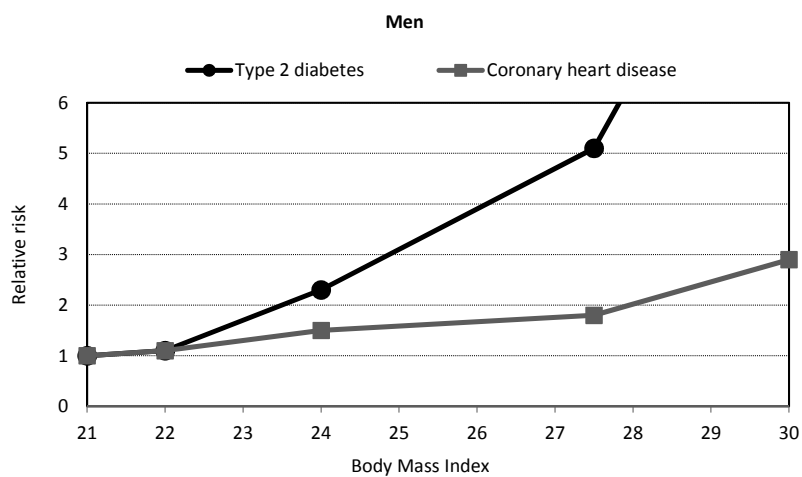
## SOCIETAL IMPACT OF OVERWEIGHT AND OBESITY

Overweight is associated with a loss in health-related quality of life (HRQL), mainly due to physical problems.<sup>8-10</sup> This relationship is predominantly mediated by overweight-related joint pain and co-morbidities, e.g. diabetes, but there is a direct influence of BMI on HRQL as well.<sup>10</sup> Thus, the current rise in the prevalence of overweight and the impending rise in related diseases will impair the quality and duration of life of the Dutch population.

The Dutch government, health care insurers and employers are concerned about these developments. They and other stakeholders (e.g. the food industry), have agreed to work together in an effort to fight the increase in overweight prevalence within the *Convenant Gezond Gewicht* (Covenant Healthy Weight).<sup>11</sup> Some of their concerns involve the economic consequences of overweight.<sup>12</sup> Overweight and obesity have a substantial impact on health care expenditures (direct costs) as well as a possible impact on costs due to absenteeism, reduced performance, disability and early retirement (indirect costs).<sup>13</sup> Direct costs of overweight in the Netherlands have been estimated at 2% of the total health care costs in 2003.<sup>14</sup> Regarding indirect costs,



**FIGURE 1.1** Relation between BMI up to 30 and the relative risk of type 2 diabetes and coronary heart disease for women in the Nurses' Health Study [Adapted from Willett, Dietz, Colditz [1999]<sup>4</sup>]



**FIGURE 1.2** Relation between BMI up to 30 and the relative risk of type 2 diabetes and coronary heart disease for men in the Health Professionals Follow-up Study [Adapted from Willett, Dietz, Colditz [1999]<sup>4</sup>]

a recent systematic review of longitudinal studies found a trend for overweight to be predictive of long term spells (> 7 days) of sick leave and strong evidence that obesity is predictive of long term sick leave.<sup>15</sup> Another review showed increased risk for work disability among overweight and obese subjects.<sup>16</sup> A large population based study showed that obesity in early adulthood is associated with almost doubled costs for lifetime productivity losses compared to normal weight.<sup>17</sup> Two other studies found that obesity was associated with presenteeism (i.e. reduced work-performance due to health problems).<sup>18, 19</sup>

These data present justification to invest in the prevention and treatment of overweight in order to contain future health care and labor-related costs, though it is not entirely clear if, in the long run, these investments will result in cost savings for society as a whole and employers in particular. Costs for pharmaceuticals will likely be reduced, but substantial additional costs for long-term care are expected.<sup>20</sup> Although, curative interventions that result in an increase in expected life years can increase costs due to prolonged survival as well.<sup>21</sup> There is also preliminary evidence that additional costs for end-of-life care would be offset by earlier gains in productivity.<sup>17</sup> Nevertheless, the appropriate question that needs to be answered is not whether prevention and treatment of overweight saves money, but whether it offers value for money in improving the duration and quality of life.

### **ADVANTAGES AND THREATS OF WORKPLACE HEALTH PROMOTION**

Community settings like schools and worksites have been recognized as viable places for population-based interventions for weight management.<sup>22</sup> Workplace Health Promotion (WHP) has several strong points from the Public Health perspective. The majority of adults is employed (in the Netherlands about 55% of the population between 20 and 65 years of age); workplaces consist of fairly homogenous groups of people; existing communication channels and social networks can be used; and, depending on the worksite and location, environmental changes are possible.<sup>23</sup> On the other hand, the health profile of the working population is more favorable than that of the general population. Indeed, the prevalence of overweight is lower among workers than in the population at large, but at 37% still considerable.<sup>24</sup> Addressing overweight in the work setting could therefore have a positive impact on public health. There is a possible downside. In the context of a constrained budget for public health, investments in worksite weight management could impede spending for groups that have greater health risks. As weight management-related WHP in the Netherlands presently is financed by employers, and not through public funds, this does not appear to be a real threat.

Weight management at the worksite has advantages but also potential drawbacks for the employee. Research shows that employees who participate in lifestyle programs experience beneficial health outcomes.<sup>25</sup> For the majority of the Dutch employees this is the most important reason for taking part in WHP-activities.<sup>26</sup> The possible adverse effects of workplace weight management for employees involve ethical issues such as restriction of autonomous decision making, discrimination on

the basis of health risks and violation of privacy.<sup>27, 28</sup> In light of the health benefits a weight management program could yield for employees, offering (proven to be effective) programs at the worksite is justifiable. However, employees cannot be obliged to take part in WHP and their health status may not be disclosed to the employer. Current Dutch law protects these rights adequately.<sup>29</sup>

The returns that lifestyle-oriented weight management programs could generate for Dutch employers are increased work-productivity and intangible benefits such as employee attraction and retention. Medical care in the Netherlands is funded by a dual system of public and private insurance of which currently about 50% of contributions is paid by employers. The employers' contribution is mostly independent of the health-insurance claims made by the employees. Thus, reductions in health care utilization are of little importance to Dutch employers. The most important advantages of WHP as viewed by them are prevention of sickness absence (25%), improvement of health and well-being of their employees (24%), improvement of work climate (18%) and improvement of working conditions (18%).<sup>26</sup> There is evidence, mostly from US-based research, that WHP results in cost-savings for the employer due to reductions in absenteeism.<sup>30</sup> The financial returns were restricted to studies applying a non-randomized design. Randomized controlled trials showed financial losses.<sup>30</sup> Rigorous research is therefore needed, as well as information about the transferability of these results to the Dutch setting. To date, it is not certain that weight control programs result in cost-savings for Dutch employers, either in the short or long term.

Programs aimed at physical activity and nutrition are seldom used in the Dutch work setting.<sup>26</sup> This has to do with an emphasis on return-to-work interventions and relatively little demand of employers for primary prevention.<sup>31, 32</sup> As of late, this may be changing due to an aging workforce and a rising number of obese employees. Investing in the 'vitality' of employees has become a trend among larger corporations.<sup>33-35</sup> The time seems ripe for a weight management program aimed at employees. Research should give insight into its (cost-)effectiveness for employees, the employer and for society as a whole.

## **GENERAL PRINCIPLES BEHIND WEIGHT MANAGEMENT PROGRAMS**

Weight management guidelines in the US and the Netherlands recommend using a structured program of diet, exercise and behavior therapy.<sup>36, 37</sup> Diet and exercise are aimed at creating a negative balance between energy in from food and beverages and energy out from physical activity. Dutch dietary recommendations for weight loss encourage an energy intake of 600 kcal less than usual intake.<sup>37</sup> Macronutrient (i.e. protein, fat and carbohydrates) composition is not important, as long as calories are restricted.<sup>38</sup> Physical activity should at least amount to the Dutch guideline of a minimum of 30 minutes of moderate to vigorous activity on 5 or more weekdays, but preferably to 60 minutes on all days.<sup>37</sup> Behavior therapy (BT) refers to a set of behavior change techniques that help in modifying behaviors.<sup>39, 40</sup> In the context of weight management, cognitive strategies are usually added to BT. Such programs aim to teach skills that help patients change their dietary and physical activity behaviors.

These skills include self-monitoring of food intake and physical activity, setting behavioral goals, gaining control over external and internal stimuli, substituting unwanted behavior with more favorable alternative behaviors, problem solving techniques, and cognitive restructuring in which dysfunctional thoughts are replaced with more realistic ones.<sup>40</sup> The program can be delivered individually or in groups. Typically a weight management program lasts for about six months and offers weekly sessions.

### **INDIVIDUAL COUNSELING THROUGH TELEPHONE AND E-MAIL**

Current evidence shows that WHP programs aimed at improving nutrition, physical activity, or both, result in modest weight reductions. Two systematic reviews showed an average comparative loss of respectively 1.3 kg [95% CI -2.1, -0.3]<sup>41</sup> and 1.2 kg [95% CI -1.6, -0.7]<sup>42</sup> at 6-12 month follow-up. Structured programs with scheduled sessions appeared more effective than self-directed approaches, and information plus behavioral counseling resulted in more benefit than information alone.<sup>41</sup> However, the sustainability of these results is unknown. Furthermore, participation in weight management programs at the worksite is limited.<sup>43</sup> Lack of time is frequently mentioned by employees as a barrier for participation.<sup>44-46</sup> They favor a worksite health program that is offered at a convenient time and location.<sup>44, 45</sup> Worksite programs making use of telecommunication technology for personal counseling, such as e-mail and phone, have the potential to address these concerns. Distance counseling has been applied to weight loss, dietary behaviors and physical activity in other settings. Results of some trials show that phone counseling is effective for short term weight loss,<sup>47, 48</sup> but other trials did not demonstrate effectiveness.<sup>49-51</sup> The majority of phone counseling studies for physical activity and dietary behavior found behavior changes.<sup>52</sup> Weight loss programs with personal feedback by e-mail have also resulted in short term weight loss<sup>53-57</sup> in some studies and no effect in others.<sup>58</sup> E-mail feedback produced mixed effects on diet<sup>53, 54</sup> and no effect on physical activity.<sup>53, 54, 59</sup> Only one of these distance counseling studies recruited participants from a work setting.<sup>53</sup> It can be concluded that both methods of distance counseling show potential to change lifestyle behaviors and reduce body weight. However, effectiveness among overweight workers, effectiveness from distance counseling without additional face-to-face and group meetings, long-term effectiveness, and differences in effectiveness between the two counseling modes are not known.

### **ALIFE@WORK**

Considering the impact of overweight on public and occupational health, and the possibilities for relieving this impact through WHP, it was decided to study the short-term and long-term effectiveness and cost-effectiveness of a weight management intervention with distance counseling (i.e. the 'Leef je Fit' program). This study was called the Amsterdam Lifestyle Intervention on Food and Exercise at Work study: ALIFE@Work. This thesis describes the design of this study and the results that were found.

## LEEF JE FIT

In the US, HealthPartners, a Minnesota-based Health Maintenance Organization (HMO), has offered lifestyle counseling by phone since 1994.<sup>60</sup> Counseling for weight management is part of their services and was evaluated in an uncontrolled study among obese HMO members.<sup>61</sup> In this pilot study, an intervention designed according to behavior therapy principles was evaluated. The intervention resulted in a mean 6.1 kg weight loss after six months in participants who completed the trial. Based on the promising results of this pilot study, it was decided to replicate this intervention in the ALIFE@Work study. At the time the study started, an advanced version of the intervention, called 'A Call to Change...Healthy Lifestyles, Healthy Weight', was available. 'A Call to Change' materials consisted of a workbook, food and activity logs, a step counter and phone-counseling protocols. The materials were translated to Dutch and to a Dutch tone of voice. Further adaptations concerned cultural elements such as food and calorie charts, cooking methods, options when eating out and opportunities for everyday physical activity. Also, supplementary content with regard to physical activity was added. Changes in content were made to make the Dutch program appropriate for moderately overweight employees with no, or few, previous weight loss attempts. Furthermore, a website was developed. The website approximated the workbook closely but contained additional interactive elements and web-tools such as a BMI-calculator, a calorie expenditure calculator and graphs. The graphs showed trajectories of calorie intake, calorie expenditure and body weight of the participant. An example of one of the web pages can be seen in figure 1.3.

Phone counseling protocols were modified to reflect the workbook adaptations. E-mail counseling protocols consisted of a mixture of ready-made text tailored to different options, and free-text for personal feedback by the counselor. Instructions for counselor-feedback were similar in the phone- and e-mail protocols. The Dutch



FIGURE 1.3 Webpage [www.leefjefit.nl](http://www.leefjefit.nl): overview of the modules



intervention was called 'Leef je Fit' (in English: 'Live Yourself Fit') to reflect that a healthy lifestyle is the key to a healthy body. The program emphasized small, stepwise changes in diet and physical activity that are easy to fit into daily life. Participants were stimulated to eat a healthy diet, according to Dutch recommendations for the basic food groups and optimal quantities of basic food items. The use of snacks, sweet and fat food, and alcoholic and sugary drinks was discouraged. Adherence to such a diet will usually lead to a reduction in caloric intake. Participants were also encouraged to acquire 60 minutes of moderate to vigorous exercise on each day of the week. Participants were told to look for everyday opportunities to be physically active, such as taking the stairs, and choosing active transport to work. Furthermore, exercise schedules for walking, running, cycling and swimming, adjusted to different age categories, were provided.

A further description of the intervention can be found in chapter 2 of this thesis.

### CONCEPTUAL MODEL AND HYPOTHESES OF THE STUDY

Several reviews have shown that interventions based on behavior therapy are effective in changing diet and physical activity and enhancing weight control, i.e. weight loss and weight maintenance.<sup>62-64</sup> Health outcomes of weight loss are a decrease in fat mass, a reduction of waist circumference, and a possible decrease in blood pressure and total cholesterol.<sup>65-68</sup> Furthermore, a healthy diet and increased physical activity have positive effects independent from weight loss. Physical activity can reduce waist circumference and blood pressure, improve lipid profiles and increase cardiovascular fitness.<sup>69</sup> A diet rich in fruit, vegetables and unsaturated fatty acids helps to lower blood pressure and total cholesterol.<sup>70</sup> Finally, improved health leads to improved health-related quality-of-life. Within economic evaluations this is often measured as Quality Adjusted Life Years (QALYs); an outcome that takes both the duration of life as well as health-related quality-of-life into account.

We hypothesized that a lifestyle intervention program based on behavior therapy would result in favorable changes in diet (fat, fruit and vegetable intake) and physical activity, compared with only providing general information on lifestyle change. Consequently, body weight, waist circumference, fat mass as measured by sum of skinfolds, total cholesterol, blood pressure, cardiovascular fitness and QALYs achieved would improve (more) in the experimental condition.

No direct comparison between phone- and e-mail counseling has taken place so far. Evidence to support a hypothesis about the superiority of either mode of counseling is therefore not available. Confirmation exists that reviewing goals and activities with a counselor and receiving advice and encouragement supports behavior change.<sup>71</sup> As a flowing exchange of information is easier to establish by phone than through e-mail and because verbal contact contains emotional cues, phone contact makes it easier to adapt to the specific situation of the recipient and to establish a bond. This, and because phone counseling is probably perceived as more personal, could make it more effective for supporting behavior change than e-mail counseling. On the other hand, verbal conversations can easily be forgotten, whereas e-mail can

be read at a convenient time, can be read again, and, as a consequence of this, may have a more profound effect. We therefore had no assumptions regarding the superiority of the counseling methods.

Several modeling studies have shown that face-to-face lifestyle counseling for weight control can be considered cost-effective from the societal perspective.<sup>72-74</sup> Information about the societal cost-effectiveness of weight control interventions using distance counseling is lacking, as is information about societal cost-effectiveness in employees.<sup>41, 75</sup> Based on the evidence from face-to-face counseling, we hypothesized that a weight control intervention with distance lifestyle counseling would be cost-effective in comparison to the control condition.

In large-scale studies outcomes often have to be collected by self-report of the participants, because it is unfeasible to use direct measurement for all outcomes. However, the self-report of anthropometric outcomes have been found to be biased.<sup>76-80</sup> The accuracy of the self-report of body weight, body height and waist circumference has never been studied in a Dutch population. Based on earlier research, we hypothesized that body weight would be under-reported, body height over-reported,<sup>79</sup> and waist circumference under-reported.<sup>77, 78</sup>

## OBJECTIVES

The main aim of this thesis is to evaluate, among an overweight working population, the (cost-) effectiveness of a lifestyle counseling program with two modes of distance counseling, i.e. telephone and internet. The main effectiveness outcome is body weight. Other outcomes of interest are waist circumference, physical activity, eating habits, blood pressure, total cholesterol level, sum of skinfolds and cardiovascular fitness. Cost-effectiveness outcomes are body weight and Quality Adjusted Life Years (QALYs) gained. The secondary objective of this thesis is to compare the effectiveness of the different communication modes. Thirdly, the thesis aims to assess the accuracy of the self-report of body weight, body height and waist circumference.

## OUTLINE OF THE THESIS

Chapter 2 of this thesis describes the design of the study, including a description of the lifestyle program and the two versions of counseling. In chapter 3 the agreement between self-reported body weight, body height and waist circumference and measurements by research personnel is presented. Chapter 4 presents the results of the lifestyle intervention on body weight, waist circumference, diet and physical activity after six months, directly after conclusion of the intervention. The results on the same outcomes after two years are described in chapter 5. In chapter 6 the results on blood pressure, total cholesterol level, sum of skinfolds and cardiovascular fitness after six months and after two years are presented. The results of the cost-effectiveness analysis of the lifestyle intervention with regard to effects on body weight and QALYs are presented in chapter 7. In the final chapter the main findings of this thesis are summarized, methodological issues of the study are discussed and implications for public health and directions for future research are given.

